The SmartHubs Ladder

DESCRIPTION OF THE MULTIDIMENSIONAL MOBILITY HUB TYPOLOGY

SmartHubs

The SmartHubs Integration ladder – description of the multidimensional mobility hub typology

A mobility hub, as defined in the SmartHubs project[1], is a physical location where different shared transport options are offered at permanent, dedicated and well-visible locations and public or collective transport is available at walking distance. Mobility hubs are defined and operationalised in many different ways, and operational hubs differ in size and functionality A common element is the presence of shared mobility services, e.g., shared bikes, shared scooters, and shared cars. Public transport services can be at the hub or at walking distance. Mobility hubs can also provide a range of mobility-related and non-mobility services. Mobility related services can include for example charging points for electric cars or bicycles, a digital pillar providing information. Non-mobility related facilities can include for example waiting area spaces, kiosk for coffee, parcel storage or activity centres.

The concept of "mobility hub" builds upon earlier concepts used in the academic literature and planning practice focussing on physical transfers in the passenger transport domain (e.g. park and ride facilities, multi-modal transfer points) and freight logistics domain (e.g., urban and regional distribution centres). The main value added of the concept is that it can help to provide an integrated planning approach, involving integration between policy instruments involving different modes, infrastructure provision, management and pricing, transport and land use measures and other policy areas.

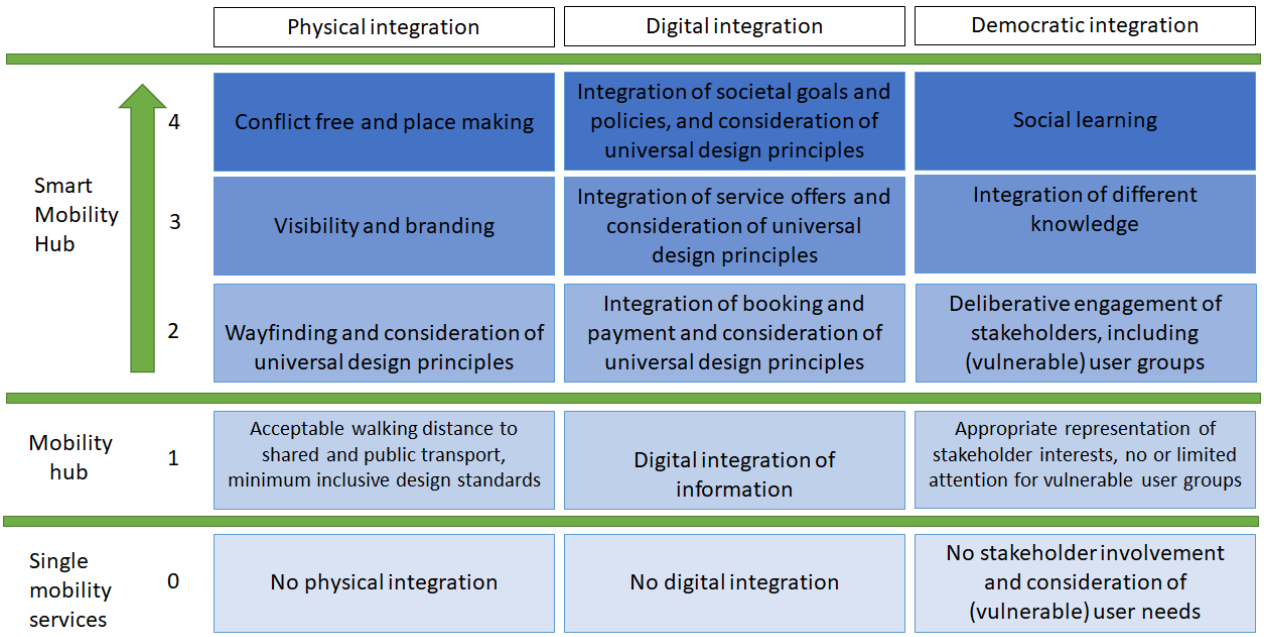
This document summarises the SmartHubs integration Ladder[1]. The SmartHubs Integration Ladder allows the comparison of different hubs with different services, understanding potential effects, and aiding the integration of societal goals into mobility hub developments. The typology can also help to assess which characteristics create more user value, usage and user satisfaction levels and higher societal impacts in terms of reduced car use and ownership levels, accessibility impacts, impact transport emissions, etc.). The typology is used to classify existing mobility in Europe and made accessible in the SmartHubs Open Data Platform which allows an easy "expert crowd" mapping of the operational/planned mobility hubs.

The SmartHubs Integration Ladder is based on three dimensions: the physical, digital and democratic integration dimensions, each dimension having 5 levels. Physical integration describe how well the physical connection of multiple mobility modes and other functions are physically integrated. Digital integration describes how well information from various mobility offerings are integrated into a single digital platform. The third dimension is democratic integration based on principles of participatory governance, encompassing integration of citizens in the development of hubs to create more inclusive hubs catering for the needs of a wide variety of different users. The SmartHubs ladder is visualised below. Based on the ladder, a *Smart Mobility Hub* is defined as a mobility hub which offers advanced levels

[1] Geurs, K.T., Münzel, K., Duran, D., Gkavra, R., Graf, A., Grigolon, A., Hansel, J., Kirchberger, C., Klementschitz, R., Martinez Ramirez, L., Pappers, J., 2022. A multidimensional mobility hub typology and inventory. SmartHubs Deliverable D 2.1. Available at: https://www.smartmobilityhubs.eu/_files/ugd/c54b12_819c85702a6442c6bebb18538fb93516.pdf

of physical, digital and democratic integration (i.e. minimum level 2 on physical, digital and democratic integration).

The higher up the physical, digital and democratic ladders, the "smarter" the mobility hub becomes. Note that going up the ladder (e.g., from level 1 to 2) implies all criteria for the previous level are met. The hypothesis is that the "smarter" the mobility hub, the more user value is created, higher usage and user satisfaction levels are achieved and increased societal impacts can be expected (in terms of reduced car use and ownership levels, accessibility impacts, impact on transport emissions, etc.). In other words, smart mobility hubs with high levels of integration are more likely to become a game changer towards inclusive sustainable urban mobility and accessibility.



The SmartHubs integration ladder (Source: Figure 2-5 in Geurs et al., 2022)

The physical, digital and democratic integration dimensions of the SmartHubs Integration Ladder are described below.

Physical integration

Physical integration describes the effort of clustering mobility and non-mobility services together in public space. Next to placing them close to each other, also visibility and access without physical barriers increase usability and accessibility.

The physical integration ladder comprises the following levels.

- Level 0: **No physical integration.**
  - One shared transport mode, not at walking distance to public transport, no integration between the modes.
  - No inclusive design criteria are considered. Level 0 does not entail the application of any principle or other accessibility considerations
- Level 1: **Acceptable walking distance to shared and public transport**

- At least two shared transport modes in acceptable walking distance to public transport.
- At least one service (e.g., shop, parcel locker, kiosk) in acceptable walking distance.
- Universal design: the minimum legal design requirements are considered, allowing for example people with disabilities to easily access the hub

- Level 2: **Wayfinding and universal design**
  - At least two shared transport modes in acceptable walking distance to public transport with wayfinding and information of using the service.
  - At least one service (e.g., parcel locker, kiosk) in acceptable walking distance.
  - Universal design principles are considered:
    - Universal design principle 1 - Equitable use. The design of the hubs is equally useful for people with diverse abilities.
    - Universal design principle 2 - Flexibility in use. The design of the hubs accommodates a wide range of individual preferences and abilities.
    - Universal design principle 3 - Simple and Intuitive Use. The use of the hub is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
    - Universal design principle 4 - Perceptible Information. The design of the hub communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
    - Universal design principle 5 - Tolerance for Error. The design of the hub minimizes hazards and the adverse consequences of accidental or unintended actions.
    - Universal design principle 6 - Low Physical Effort. The different elements of the hub can be reached and used efficiently and comfortably and with a minimum of fatigue.
    - Universal design principle 7 - Size and Space for Approach and Use. Appropriate size and space are provided for approach, manipulation, and use of the different physical and digital elements of the hub, regardless of the body size of users or their mobility.

Level 3: **Visibility and branding**

- At least two shared transport modes visible from a public transport stop.
- An attractive design of the mobility hub, branding and aesthetically pleasing scheme.
- At least one service (e.g., shop, parcel locker, kiosk) + information of using the service and potential conflicts (e.g., barriers between the modes that require to cross the road or walk extensively to use different modes).
- Universal design principles (from level 2) are considered.

- Level 4: **Conflict free and place making**
  - At least two shared transport modes visible from a public transport stop with no conflicts and information of using the services.
  - At least two services;
  - Placemaking and attractive space design. Place making is about creating a pleasant environment for the users. This can include public furniture such as benches, planters, bicycle racks, sheltered waiting areas, and pedestrian lighting elements. Place making can increases the feeling of belonging and

comfort, i.e., safe, secure, in a clean, nice-looking area, where they can meet other people and carry out activities
    - Universal design principles (from level 2) are considered.

Digital integration

Digital integration describes the effort of integrating information on one digital platform and making it possible for different information platforms to access information using a standard format. Through digital integration, users can easily access information provided by multiple providers in one place. Examples are travel planners that let users not only identify services offered by different providers or platforms but also plan, book and pay for services of the different providers in a single application. The digital integration levels expand the existing Mobility-as-a-Service topology[2] and include digital accessibility and universal design principles.

The five levels of digital integration of mobility services provided at mobility hubs are as follows:

- Level 0: **No digital integration** of shared and public transport mode options offered at the hub.
    - Separate services from mobility providers use different platforms.
    - No inclusive design criteria are considered.
- Level 1: **Integration of information.**
    - There is decision support for finding the best trip, on a trip-by-trip basis, offered by multimodal travel planners and assistants and/or digital information displays at the hub
    - Minimum universal design requirements such as simple and intuitive app design.
- Level 2: **Integration of booking and payment and universal design**.
    - This level offers an extension to travel planners and offer single trip planning, booking and payment options, adding for example public transport ticketing, taxi, or other transport services. It offers easier access to services for end users – such as a mobility marketplace or a one-stop shop where the user can find, book, and pay with the same app.
    - Universal design principles are considered, including simple and intuitive app design and low-tech or analogue booking alternatives are available. Information in word and pictograms to make it easy to understand the usage. Analogue options are available, including options for booking and payment on site or via phone call.
- Level 3: **Integration of the service offer,** including contracts and responsibilities.
    - This level represents integration of the service offer. Service is bundled, possibly subscription-based. MaaS operators creates value for suppliers and

[2] Sochor, J., Arby, H., Karlsson, I.C.M., Sarasini, S., 2018. A topological approach to Mobility as a Service: A proposed tool for understanding requirements and effects, and for aiding the integration of societal goals. Research in Transportation Business and Management 27, 3-14 10.1016/j.rtbm.2018.12.003

users and typically work more closely with preferred suppliers, often one per mode, in order to not only attempt to run a profitable business, but also to create value for (and attract) the suppliers and, with that, better deals for its customers.
    - Universal design principles are considered, such as simple and intuitive app design and low-tech or analogue trip booking alternatives.
- Level 4: **Integration of societal goals, policies and incentives**.
    - Incentives are implemented in the MaaS- or individual services, reflected by how well local, regional, and/or national policies and goals are integrated into the service.
    - The public authorities on a city, regional or national level can influence the societal and ecological impacts of mobility services, i.e. influencing users' behaviour by setting conditions for the operators (and individual transport service providers) so that they will create incentives for desired behaviour, such as reduced private car ownership and use, a more accessible, liveable city, etc.
    - Universal design principles are considered, including simple and intuitive app design and low-tech or analogue booking alternatives.

Democratic (participatory) integration

Democratic integration is based on principles of participatory governance, encompassing integration of citizens in the development of hubs to create more inclusive hubs catering for the needs of a wide variety of different users. The approach highlights the rights and duties of both takers and givers and allows for a more differentiated evaluation of what is going on in a process. Based on criteria for participatory governance and principles of universal design, the democratic integration ladder comprises the following levels:

- Level 0: **No involvement or consideration of stakeholder interests and user needs**.
    - No involvement of stakeholders in the process.
    - No inclusive design criteria are considered.
- Level 1: **Appropriate representation of stakeholder interests.**
    - Democratic value: Participation takers got asked in consultation processes, stakeholder dialogs, or similar formats.
    - Participation takers have recognized the information provided and have shown responsivity.
    - The usage of service also belongs to this level.
    - No to limited attention to include vulnerable users explicitly as participation takers
    - Participation method: conducting a survey, handing out flyers, brochures, etc.
- Level 2: **Deliberative engagement of stakeholders**.
    - Democratic value: the exchange of positions and interests, but there does not necessarily need to be a change in the existing planning. Vulnerable to exclusion groups are explicitly addressed as stakeholders and invited to contribute to the process.

    - Participation takers including vulnerable users argumentatively engage in decision-making. Different positions are exchanged and have been heard in a participation process.
    - Participation takers including vulnerable users actively took part in a format offered.
    - Participation givers make an invitation for participation and listen to the articulation of stakeholder interests.
    - Participating method include a public hearing, organized walks with citizens, or an invitation to send feedback via mail and to which content the administration reacts, etc.
- Level 3: **Integration of different knowledge**.
    - Democratic value: the step from Level 2 to Level 3 is a little fluent. Input gets integrated into the decision-making process in level 3. There needs to be an open question instead of a fixed plan that participation takers can comment on.
    - Participation takers including vulnerable users actively argue or deny with a policy, product, or process. Ideas, wishes, worries or conceptions of participation takers have been integrated into the participation process. They have been developed further collaboratively with participation givers and contributed to an outcome of the process.
    - Participation givers create room for decision making, and participation takers are willing to make informed decisions.
    - Participation method include a public hearing, interactive exchange during organized walks with citizens, vulnerable to exclusion groups, members of the organized civil society, etc. All formats need some kind of documentation of results that are collectively agreed on so the input can be integrated into the decision-making process. It may not always be feasible to change plans according to the input of participation processes but some sort of examination needs to happen to see if it us possible to follow a certain proposal from citizens.
- Level 4: **Social learning.**
    - Participation takers including vulnerable users and givers have networked and integrated into the community.
    - Participation has been made permanent or is meant to become permanent.
    - Participation processes have taken on a life of their own and become independent from external moderation.
    - Participation method: permanent and independent exchange between participation givers and takers, so mutual understanding and interaction get institutionalized. That could be in the form of a monthly round table, common and actively used mailing lists to correspond on specific topics, the founding of associations, fixed responsibilities within municipal administration, etc.

The SmartHubs integration ladder - summary

	Physical integration	Digital integration	Democratic integration
Level 4	**Conflict free and place making** At least two shared transport modes visible from a public transport stop with no conflicts and information of using the services and at least two services. Universal design principles are considered	**Integration of societal goals, policies and incentives** Local, regional, and/or national policies and goals are integrated into the service. Universal design principles are considered, including simple and intuitive app design and low-tech or analogue booking alternatives	**Social learning** Participation takers and givers, including vulnerable users, have networked and integrated into the community, participation becomes permanent and independent
Level 3	**Visibility and branding** At least two shared transport modes visible from a public transport stop and at least one service (e.g., shop, parcel locker, kiosk), information about the service and potential conflicts, attractive design of the mobility hub, branding and aesthetically pleasing scheme. Universal design principles are considered.	**Integration of service offers** Shared and public transport services at the hub are bundled, possibly subscription-based. Universal design principles are considered, including simple and intuitive app design and low-tech or analogue booking alternatives	**Integration of different knowledge** Participation takers, including vulnerable users, argue or deny positions, their input is integrated into the participation process, participation givers create a room for decision making
Level 2	**Wayfinding and universal design** At least two shared transport modes in acceptable walking distance to public transport with wayfinding and information of using the service and at least one service (e.g., parcel locker, kiosk) in acceptable walking distance. Universal design principles are considered	**Integration of booking and payment and universal design** Easy access to services for end users – such as a mobility marketplace or a one-stop shop where the user can find, book, and pay with the same app. Universal design principles are considered, including simple and intuitive app design and low-tech or analogue booking alternatives.	**Deliberative engagement of stakeholders** Participation takers, including vulnerable users, argumentatively engage in decision-making, exchange of positions, active participation, participation givers invite participation and listen to stakeholder interests, including those of vulnerable user groups.
Level 1	**Acceptable walking distance to shared and public transport** At least two shared transport modes in acceptable walking distance to public transport and at least one service (e.g., shop, parcel locker, kiosk) in acceptable walking distance. Minimum legal inclusive design requirements are considered	**Integration of information** Multimodal travel planners can be used to plan mobility offerings at hubs. Minimum inclusive design requirements are considered such as simple and intuitive app design.	**Appropriate representation of stakeholder interests** Participation takers got asked into a consultation process, Information are recognized. No or limited attention to involve *vulnerable user groups.*
Level 0	**No physical integration.** One shared transport mode, not at walking distance to public transport, no integration between the modes. No universal design criteria are considered	**No digital integration** of shared and public transport mode options offered at the hub. There are separate services and platforms for each mode. No universal design criteria are required	**No involvement** or consideration of stakeholder interests and user needs.

Source: Table 2-1 from Geurs et al. (2022)

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OTHER INFORMATION:

This document describes the SmartHubs Integration Ladder. For the full description and literature review please refer to: Geurs, K.T., Münzel, K., Duran, D., Gkavra, R., Graf, A., Grigolon, A., Hansel, J., Kirchberger, C., Klementschitz, R., Martinez Ramirez, L., Pappers, J., 2022. A multidimensional mobility hub typology and inventory. SmartHubs Deliverable D 2.1. Available at: https://www.smartmobilityhubs.eu/_files/ugd/c54b12_819c85702a6442c6bebb18538fb93516.pdf

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